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THE SURVEY OF GASTROPOD MOLLUSKS WITH RESPECT TO ECOLOGICAL HABITAT IN THE AURANGABAD DISTRICT (MS), INDIA.

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ABSTRACT

A survey of freshwater bodies at various locations in Aurangabad city and nearby places was carried out to have information on gastropod mollusks dwelling there in. It was observed that few spots had no the snail population. Specifically snails preferred shallow water, lentic (stagnant water) and lotic (shallow running water) habitats, whereas land slug was available in moist soil of agriculture farms. In preliminary survey eight species of Gastropod mollusks were recorded from these diverse habitats. All the species were identified with taxonomic classification by experts of Zoological Survey of India (ZSI) at Pune. The collected species of freshwater habitat are *Lymnea accuminata*, and *L. luteola* (Lamarck-1822), *Bellamya* bengalensis and *B. dissimilis* (Lamarck, 1822), *Semperula maculate* (Templeten,1858), *Tarebia lineate* (Grey,1828), *Indoplanorbis exutus* (Deshayes,1854) are of lotic habitat and land slug *Laevicaulis alte* (Ferusae, 1821), Achatina fulica (bowdich,1822) giant snail . are terrestrial ones Most of the snails are widely distributed in various aquatic habitats with wide range of ecological parameters tolerance. However, the few species *L. accuminata*, *L. leutola*, and *Taerbia lineate* were found only in stagnant waters, i.e lentic habitat These gastropod snails are representatives of diverse freshwater ecological habitats.

KEY WORD: Freshwater ,Gastropods, lentic and lotic water.

INTRODUCTION

The phylum Molluscans comprises the soft bodies' animals with or without calcareous shell adapted to almost all habitats with varied ecology. The gastropods are an extremely diverse group, potentially making classification a difficult undertaking. They are divided into three major subclass: Prosobranch, Opisthobranchia and Pulmonates. The two freshwater groups Gastropod and Pelecypoda, the former is divided further into two subclasses – **Prosobranchia** having **gills** for **water respiration** and the other Pulmonates posses' **lungs** for **aerial respiration**. The estimated number of Mollusk today varies from 80,000 species to 1, 35,000 species and the total diversity possibly as high as 2, 00,000. They are second only to arthropods in species richness (Strong *et al*., 2008). 5070 species of Mollusks are reported from India. The diversity is contributed mainly by marine mollusks, whose knowledge is far from complete. The global freshwater gastropod fauna is estimated at approximately 4,000 described species, however, the total number is probably 8,000 (Strong *et al*., 2008) .Mollusks are studied often for their beautiful shells, as source of nutritive food, as host for helminthes parasites and economic roles they have in human history. The gastropod mollusks as an important part of the ecosystem, and many aquatic animals thrive on them. Gastropods, including slugs and snails are the most successful of all mollusks, and are of special concern in that they serve as intermediate and as paratenic hosts of a variety of helminthes parasites causing!; diseases in man and domestic animals. Mollusks' have particular importance in that they form valuable fisheries in various parts of India as they are being used as food, as a source of lime, pearls and decorative shells, and as constituents of medical preparations. Most freshwater gastropods are micro-herbivorous and/or micro-omnivorous grazers feeding on bacterial films, algae and diatoms, but there are a number of exceptions: the predominantly marine Buccinidae, Marginellidae and Acochlidiida and the entirely freshwater Glacidorbidae are predators; Viviparidae and Bithyniidae are ctenidial suspension feeders at least in part; Ampullariidae are primarily macro herbivorous and are also known to feed on bryozoans and Planorbidae eggs. There are no pelagic/nektonic or parasitic species, with the great majority being benthic crawlers.

In India various freshwater snail species have been reported from different geographical provenance ,Subba Rao and Mitra (1979) made a survey on land and freshwater molluscs of Pune district (Maharashtra) and collected a total of about 130 species/varieties falling into 22 families and 51 genera, also snail species belonging to diverse aquatic habitat have been reported (Ray and mukharjee,1963),(Choubisa and Sharma,1982,1986,Rathore and Bohra,1987). Many Molluscans species are also used as bio-indicator for the paleoenvironments as well as water quality or pollution control on the basis of their power tolerance against the extremes condition on physic-chemical parameters of water quality (Harmon, 1974: Edmondson et.al 2010, Druat et.al 2011). The adaption of an ecosystem and its inhabitants to both natural & disturbing of anthropogenic (Jonson, 1995). Is also provided the bio-indicator should insight into potencies & casual mechanism. In India aquatic as well as terrestrial species of mollusk is present. Some workers have also reported that certain gastropods species Pelecypoda for the different regions tropic stages (Eutrophic, Mesotrophic and Oligotrophic).as well as lotic and lentic environments (Clarke, 1979, Choubisa, 1992). Lot of research has been done in molluscans gastropods particularly freshwater species and very less attention has been paid on garden snail & slugs also studied from Maharashtra.(Chavhan , Pawar ,2011, Jadhao ,2015).This snails may reach high abundances and cause important economically losses under the favorable environmental condition. *A.fulica* density and biomass (Raut and Barker, 2002).Strongly climate changes and hibernation, temperature and humidity reach low values (Mead, 1961; Raut and Ghose, 1984).Some gastropods are viviparous and some are oviparous in nature, and also some gastropods habitat in natural & artificial freshwater environments, including shallow lakes, stream, river, canals, ponds, wetland, as well as rice & Taro farms (Pace, 1973; Chen, 1990). Freshwater snail plays an important role in freshwater ecosystem and intermediate host for serious diseases to humans and animals like *Schistomiasis* (Snail fever) *Flat worm*, *Swimmer's Itch Fasciolosis/Fasciola hepatica, S.indicus, S. eduardiensis and S.hippopotomus.etc.* There are many causes for the decline in freshwater gastropods biodiversity, (Dudgeon *et al),* described five major factored for the loss of freshwater biodiversity, which indicated over-exploitation, pollution, flow modification, exotic species invasive and habitat degradation .Another major region for extinction of freshwater gastropods is the high degree of endemism. This aspect is typically freshwater habitats. Cosequently, the threats situation can be motivated when habitats are changed, especially in species with low dispersal ability. Differences in growth and shell of snails attributed under the combined effect of many intrinsic and extrinsic factore, including population density, size, age, gonad development nature of substratum, temperature, food availability, environmental stresses such as pollution parasitism, pathogen. etc.

Hence, while studying biodiversity and ecology of water resources nearby Aurangabad city and in Marathwada region the distribution of freshwater gastropod snail shall be worked out and also was conducted to study the gastropods population density and ecological habitat of snail species found in different location around the Aurangabad district.

MATERIALS AND METHODS

A survey was carried out for their relative distribution in diverse Lentic (stagnant water) (lake, reservoir, pond, etc) And Lotic (running water),(river, stream canals etc.)The confluence of two rivers namely, Godavari and Pravara, freshwater habitat is located nearby west Aurangabad. Kaygon toka known as new small village (Pravara sangum).The (Latitude -19º37'30.37"N, Longitude 75 º1'44.87"E) west of Aurangabad. Tisgon damis located at South of Aurangabad, city and dam new Jayakwadi (Latitude 19 º30'44.24"N, Longitude 75 º 22'29.95"E) at (Paithan), Jayakwadi reservoir, Jatwada Tanda river (Latitude 19 º57'49.07"N, Longitude 75 º16'52.86"E). Kannad river &concrete maintained pond in Botanical garden for lotus growth .Dr. B. A.M. University campus in Aurangabad .(Latitude 19 º54'9.58"N, Longitude 75 º18.42"E). Snails were collected post monsoon to late winter season was preferred because snails mostly breed and have maximum population. The collection site were visited in the morning to noon hours in which bottom& surface dwellers snail species are clearly visible and more active in this period. The live snail's specimens were collected around 100 in number from each water body by handpicking method with wearing hand gloves and water and soil sample were collected. Then snail are brought to the Departmental laboratory and maintained in separate plastic trough and provide food like aquatic plants, weed, or Chara, algae etc. Record was also prepared for collected snail species and their habitat. These snails' species were identified to the Zoological Survey of India (ZSI) to identification up to classification level.

RESULT AND DISSCUTION

Collection of more than 100 snails specimens from different ecologically diverse freshwater habitat as well as land snail, slug etc. Nine snail species were detected and identified. The species were identified with taxonomic classification by experts of Zoological Survey of India (ZSI) at Pune. Some of those are Pulmonate and some are Operculate Family like **Viviparidae**, *Bellamya bengalensis*, (Lamack,1882),*B. dissimilis* (Muller,1774). family **Lymneidae**, *Lymnaea acuminata*, (Lamarck,1882),*L. leuteola* (Lamarck,1822),Family **Veronicellidae** , *Laevicaulis alte*,(Ferussac,1821),Family **Thiaridae**, *Tarebia lineata* (Gray,1828),Family **Planorbidae** ,*Indoplanorbis exustus* (Deshayes, 1834), Family **Achatinidae** , *Achatina fulica* (Bowdich,1822). Among these all snail species were found to be widely distributed in lentic, lotic and lands habitats, some species entirely or nearly restricted in particular areas only. Such as *Lymnaea acuminata* species inhabited mostly lentic and were as *Lymnaea leuteola* was found to be restricted area only lotic water. Namely Viviparous *Bellamya bengalensis* and *B.dissimilis* is a widely distributed and survival in various aquatic habitat. The *Lymnaea acuminate, L. leuteola*, *Tarebia lineata* are highly habitat specific they prove to bio-indicator of ecologically diverse aquatic habitat. *Laevicaulis alte* is a species of tropical land slug, a terrestrial pulmonate and *Achatina fulica* is garden snail.

However, for the further confirmation snails on particular habitats in the freshwater as well as land. The species such survey in different geographical regions is recommended. The individual classifications and identification key characters of snails and distribution in various countries are as following.

Systematic position and key characters of snail species

A)-***Bellamya bengalensis****: (*Lamarck, 1822)
Phylum- Mollusca,
Class- Gastropoda
Order- Architaeniogloss
Family-Viviparidae**,**
Genus- ***Bellamya***
Species- ***bengalensis***

Key and characters

The shell of *B. bengalensis* is more or less oval in shape and acuminate. The upper part of the shell slightly conidial rather than conical. The body whorl is evenly convex in profile. It is slightly oblique. The ground color is greenish and opaque. The operculum is moderately thin and of a deep brownish complexion. The external surface is convex, the outer margin strongly curved, the inner margin slightly sinuate and the posterior extremity bluntly pointed. This snail gives birth to a large number (30-120) of fully developed young's.

Distribution: INDIA; Maharashtra, Madhya Pradesh, common to northwestern India from Allahabad to Punjab and west to Mumbai.

(B)-*Bellamya dissimilis*:(Muller,1774)
Phylum- Mollusca
Class- Gastropoda
Order- Architaeniogloss
Family- Viviparidae
Genus- ***Bellamya***
Species- ***dissimilis***

Key and characters

The shell somewhat conic, smaller, narrowly and deeply umbilicate .Dark spiral band. With faint microscopic spiralstriae. Body whorl subangulate at the periphery, rim of aperture often blacks.

Distributed. INDIA: Maharashtra, Madhya Pradesh, Orissa, Pondicherry and common thought India. ELEWHERE: Bangladesh; Malaysia; Myanmar; Pakistan and Srilanka.

(C)-*Lymnaea leuteola* (Lamarck, 1822)
Phylum - Mollusca
Class- Gastropoda
Order- Hygrophila
Family- Lymneidae
Genus- ***Lymnaea***
Species- ***leuteola***

Key and Characters

Shell thin and longish, whitish and translucent. The body whorl is large with oval shaped aperture. This freshwater mollusk is usually found attached to aquatic vegetation in lentic habitats.

Distribution: Widely distributed throughout south and Southeast Asia. It is very common and a widespread species with locally abundant population. It is a pest of paddy and aquatic plants (Azola) which are used to produce bio fertilizer in West Bengal, India (Subba Rao 1989).This species is used in research.

(D)-*Lymnaea acuminata* (Lamarck.1822)
Phylum- Mollusca,
Class- Gastropoda
Order- Hygrophila
Family- Lymneidae
Genus- ***Lymnaea***
Species- ***acuminata***

Key and characters

Shell thin, Semitransparent, Ovate with a short acuminate spire, body whorl much inflated, a little angular above, Aperture large and collumella twisted.

Distribution: INDIA**;** Maharashtra, Madhya Pradesh and common thought India

ELSEWHERE: Bangladesh, Myanmar and Pakistan.

(E)-*Tarebia lineate* (Gray, 1828)
Phylum - Mollusca,
Class- Gastropoda
Order- Sorbecoconcha
Family- Thiaridae
Genus- ***Tarebia***
Species- **lineata**

Key and Character

Tarebia lineate is a predominantly freshwater snail. It has a dextrally coiled, elongate-conical shell, with 8-12 whorls. The apex of the spire is usually eroded and the sides are concave in outline. He shell is sculptured with prominent nodes overlapping the suture between whorls and forming crenulations the base is marked with prominent spiral ridges. Adults range from 6 to 40 mm, but more normally reach 20-35 mm.

(F)-*Indoplanorbis exustus* (Deshayes, 1834)
Phylum - Mollusca,
Class- Gastropoda
Order- Hygrophila
Family- Planorbidae
Genus- ***Indoplanorbis***
Species- ***exustus***

Key and Character

Shell greenish brown, finely ridged, spire rather flat end, whorl 3, last large aperture angularly raised, then depressed, sloped expanded below, rather produced. The shell of this species, like all Planorbids is sinisterly in coiling, but is carried upside down and thus appears to be dextral. Each whorl is higher than it is wide the width of the shell is 5-25 mm the height of the shell is 4.513 mm.

Distribution: INDIA; Maharashtra, M. Pradesh, Thought the plains of India

ELSEWHERE: Celebes, Indochina, Java, Malaya, Myanmar, Pakistan, Persia, Srilanka and Thailand.

(G)-*Achatina fulica* (Bowdich, 1822)
Phylum - Mollusca,
Class- Gastropoda
Order- Systellimmatophora
Family- Achatinidae
Genus- ***Achatina***
Species- ***fulica***

Key and Character

Conical shell, twice as high as it is broad. Either clockwise (dextral) or counter-clockwise (sinisterly) directions can be observed in the coiling of the shell, although the right-handed (dextral) cone is the more common. Shell coloration highly variable and dependent on diet. Typically, brown bands running across the spirals."The adult snail is around 7 centimeters (2.8 in) in height and 20 centimeters (7.9 in) or more in length. The shell is particularly tough and has the highest heavy metal content of any snail species.

(H)-*Laevicaulis alte* (Ferussac, 1821)
Phylum- Mollusca,
Class- Gastropoda
Order- Systellimmatophora
Family- Veronicellidae
Genus- ***Laevicaulis***
Species- ***alte***

Key and Character

Body is elongated, oval when contracted, linear when extend. A deep furrow present around the margin separating the mantle from the foot. Head retraces under the mantle. Two pairs of tentacles Foot when retracted does not extend over the anus and opening slit like, not covered by any flap. “Dimension: length50 to 80 mm, width 24 to 30 mm” (Bentham-Jutting, 1952); “Body length: 50-80 mm; body is a round, dark-colored slug with no shell, 7 or 8 cm long. Its skin is slightly tuberculata. The central keel is beige in color. This slug has a unique, very narrow

foot; juvenile specimens have a foot 1 mm wide and adult specimens have a foot that is only 4 or 5 mm wide. The tentacles are small, 2-3 mm, 2008) this species lives in dry areas, mostly at lower, Hermaphrodite, both self and cross fertilization takes place.

Hence, the present study is that these gastropods snails' species can be used for identification and classification of gastropods snails habitats without going for the details of physico-chemical parameters analysis in water as well as soil.

Table. No. (1)- The Snails species collected from diverse ecological habitats near Aurangabad district

Sr.No	Snail species	Lotic habitat			Lentic habitat			Terrestrial Habitat
	(A)- PULMONATES Family: Lymneidae	**River**	**Stream**	**Canal**	**Lake**	**Reservoir**	**Pond**	**Land**
1	*Lymnaea acuminata* (Lamarck,1822)	+	-	-	-	+	+	-
2	*L. leuteola* (Lamarck,1822)	+	-	+	-	-	-	-
	Family: Planorbidae							
3	*Indoplanorbis exustus* (Deshayes,1834)	-	+	+	-	-	+	-
	(B)-OPERCULATES Family: Melaniidae (Thiaridae)							
4	*Tarebia lineata* (Gray,1828)	-	+	+	-	+	+	-
	Family: Viviparidae							
5	*Bellamya bengalensis* (Lamarck,1882)	+	+	-	+	+	+	-
6	*Bellamya dissimilis* (Muller,1774)	+	+	-	+	+	+	-
	Family: Veronicellidae Land snail/Slug							
7	*Laevicaulis alte* (Ferussac,1821)	-	-	-	-	-	-	+
8	*Semperula maculate* (Templeton,1858)	-	-	-	-	-	-	+
9	Family: Achatinidae, *Achatina fulica* (Bowdich,1822)	-	-	-	-	-	-	+

(+, Inhabitat; -, not found)

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PLATE-I

Fig.(A1) Satellite Jayakwadi Dam Aurangabad Canal (Paithan) (GPS) (L-19º30'44.24''N, Long-75 º 22'29.95''E)

Fig.(B1)- Godavari River (Kaygon) (GPS) (L-19º 37'30.37''N, Long-75º 1'44.87''E)

Fig. (C1)-Concrete Artificial Pond Botanical Garden Dr. B. A. M. University, Campus. Aurangabad. (GPS) (L-19º 54'9.58''N, Long-75º 18'42.29''E)

Plate-II

A)-*Bellamya bengalensis* (Lamarck, 1822)

(B) - *Bellamya dissimilis* (Muller, 1774)

(C)- *Lymnaea leuteola* (Lamarck, 1822)

(D)-*Lymnaea acuminate* (Lamarck, 1822)

(E)-*Tarebia lineate* (Gray, 1828)

(F)-*Indoplanorbis exustus* (Deshayes, 1834)

(G)-Achatina fulica (Bowdich, 1822)

(H)- *Laevicaulis alte* (Ferussac, 1821)

Fig.2- (A-H) Snails species collected from diverse ecological aquatic and terrestrial /slug in Aurangabad District

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